



Douglas-fir tussock moth (*Orgyia pseudotsugata*):

A conifer defoliating caterpillar with potential for outbreaks in Okanogan County.

Importance. The Douglas-fir tussock moth (DFTM) is a defoliating caterpillar that can severely damage Douglas-fir, true fir, and spruce trees in the western United States. In eastern Washington, outbreaks are cyclical and may cause top kill, growth loss, and may kill up to 40% of host trees in an infested stand.

Monitoring. The USDA Forest Service and Washington Department of Natural Resources (DNR) conduct annual monitoring of Douglas-fir tussock moth (DFTM) activity in Washington State using an “Early Warning System” of pheromone-baited traps. The DNR traps at 200 locations on state and private land in eastern Washington. When the number of moths caught in traps increases, the DNR conducts ground surveys near trap locations to define specific areas at risk of defoliation.

Current status in Washington. Increased numbers of Douglas-fir tussock moths were collected in monitoring traps in 2007 and 2008 in north-central Washington, primarily in Okanogan County. Two areas of DFTM defoliation have been detected in Okanogan County. One area is on Palmer Mountain, four miles north of Loomis and the other is near Chesaw Road, five miles east of Oroville. Total 2008 defoliation covers approximately 300 acres of federal and privately owned lands. The most severely affected Douglas-fir trees had approximately 40% of their foliage eaten in 2008. DFTM egg masses have been found over a much wider area during ground surveys, indicating that the defoliated area around these two sites is likely to expand during summer 2009.

Egg masses were also found at 15 other sites out of 85 areas checked in eastern Washington. All 15 sites were in Okanogan County: in the Methow Valley; near Molson; and west of Omak (Fig. 1). Egg masses at these locations were not abundant enough to predict defoliation of any specific place in 2009. Therefore, it is important that landowners and land managers in these areas watch the forests for defoliation and signs of DFTM beginning in June 2009.

Douglas-fir Tussock Moth Sampling Results in Okanogan County Washington 2008

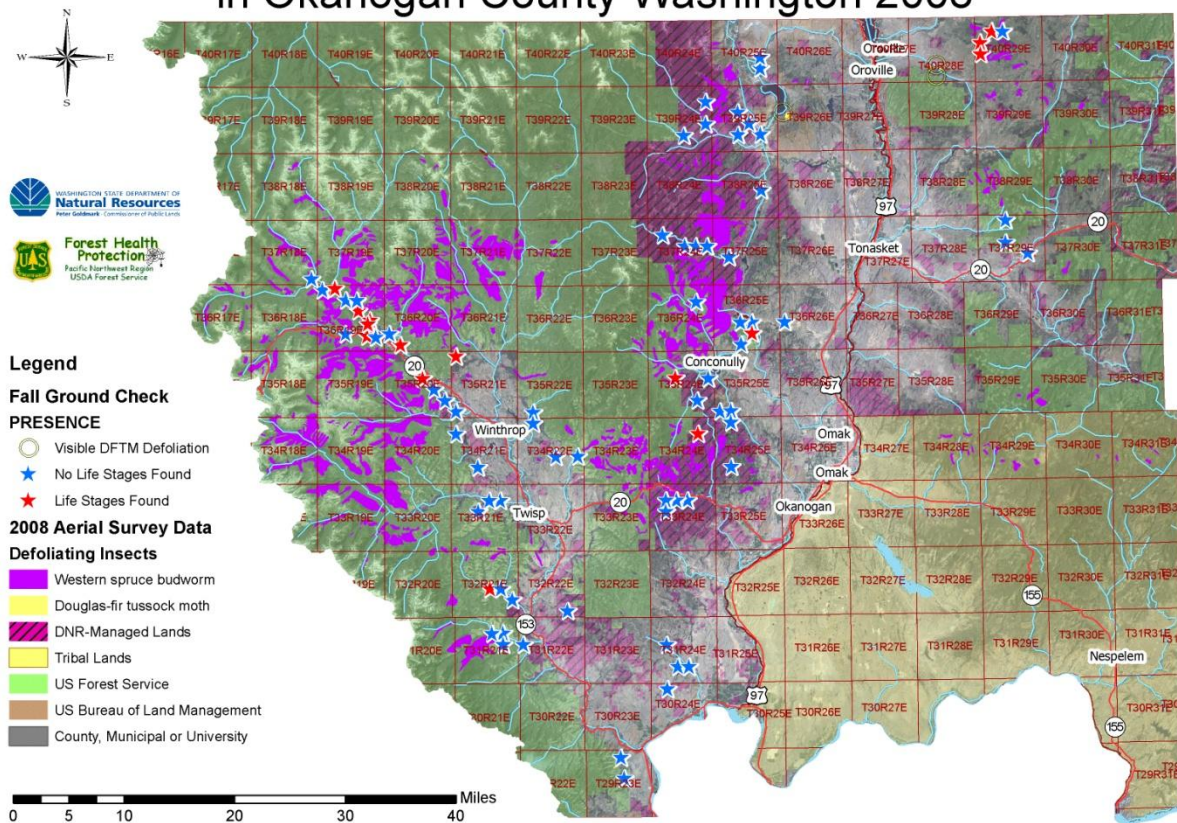


Figure 1. 2008 Douglas-fir tussock moth ground sampling results for Okanogan County.

Hosts. Douglas-fir, grand fir, and sub-alpine fir in forest environments. Blue spruce and Engelmann spruce in ornamental plantings.

Impacts. In a severe outbreak, as much as 40% of host trees in a stand may be killed. Surviving trees may have top-kill and suffer growth loss. The trees most vulnerable to mortality are those with the least foliage, such as young trees and those growing in dense stands. Defoliated trees are more susceptible to mortality from bark beetle attacks. The hairs of DFTM caterpillars are skin irritants to many people, which can limit use of recreational areas during severe outbreaks. The last outbreak in Washington occurred during 2000 to 2002, leaving more than 45,000 acres defoliated in 2000.

Signs and symptoms to look for. DFTM egg masses can be found on the underside of branches and on structures through the winter. Egg masses are about 1 inch across, round, grey, hairy, with white eggs (Fig. 2). Mature caterpillars with distinctive tight tufts of hair, called “tussocks,” can be seen from June through early August (Fig. 3). The cocoons are about 1 inch long, tan, and hairy (Fig. 4). They can be seen throughout the year on branches and structures, but only contain live pupae in July and August.



Figure 2. Adult female Douglas-fir tussock moth (left) and egg mass (right).



Figure 3. Mature Douglas-fir tussock moth caterpillar. *Photo: Ladd Livingston, Idaho Dept. Lands.*



Figure 4. Douglas-fir tussock moth cocoon.

Adult male DFTM are brownish grey with feathery antennae and a wingspan of about 1 ¼ inches. Female adults are grey to brown, about ¾ inch long with a wide abdomen, and are flightless, so wings are not noticeable (Fig. 2).

Caterpillars feed on both new and old foliage and defoliation can be most severe in the top crown (Fig. 5). Sometimes webbing can be seen in the tops of tussock moth infested trees. Feeding by DFTM in June and July may completely remove needles from branches or may cause new foliage to turn brown. This damage can be confused with defoliation caused by the western spruce budworm. Defoliated ornamental spruce trees in non-forested areas are known as “sentinel trees” because their damage often precedes forest defoliation. There is no direct, predictable relationship between the location of sentinel trees and locations where forest areas will be defoliated.

Life cycle. DFTM completes one generation per year. In late May or early June, eggs hatch shortly after host trees flush new needles in spring. New caterpillars spin silk webbing and can disperse by wind. This webbing can sometimes be seen in the tops of trees. Caterpillars begin by feeding on new needles, turning them brown, and then they feed on older needles. When mature in late July or early August, caterpillars will spin a tan cocoon covered with body hairs attached to the underside of branches or on nearby structures. In late July through November, adults emerge and mate. The females are flightless and cling to their cocoon where they deposit pearly-white eggs in a grey mass of body hairs bonded together with saliva. The eggs overwinter attached to the cocoon.

Infestation cycle. DFTM populations are normally kept low by natural controls that include disease, predators, food supply, and weather. Periodically, DFTM populations are able to escape these controls and outbreaks occur.



Figure 5. Top down defoliation damage caused by Douglas-fir tussock moth.

Photo: William M. Ciesla, Forest Health Management International.

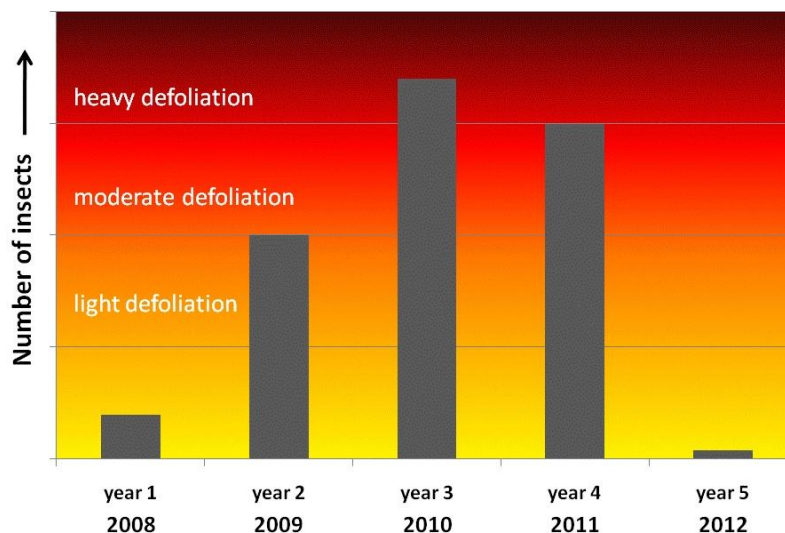


Figure 6. Typical Douglas-fir tussock moth outbreak cycle.

Adapted from USDA Forest Service Region 6 Forest Health Protection.

Outbreaks typically collapse within two to three years due to a combination of build-up in natural enemies and/or starvation (Fig. 6). Early in the outbreak, egg masses can be analyzed to determine the level of virus and parasitism. This information can be used to predict the duration and possibly predict severity of the outbreak.

Control. If no actions are taken to manage or prevent DFTM damage, the outbreak will subside in two to four years due to a build-up of natural controls. Management options are available to protect host trees valued for timber, recreation, or aesthetics.

Natural. After the first two years of defoliation, any combination of virus, parasites, predators, disease, or starvation will cause the DFTM population to collapse by the fourth year.

Silvicultural. DFTM does not damage ponderosa pines. If timed before an outbreak, thinning the forest to reduce the proportion of Douglas-fir and true fir can reduce DFTM damage. After an outbreak, killed trees can be salvaged as timber or left standing. High numbers of standing dead trees may create fire or falling hazards. Some dead trees can provide value as wildlife habitat.

Insecticides. For immediate reduction of defoliation, insecticides can be sprayed on host trees when caterpillars are feeding. Conventional insecticides and a bacterial insecticide, “Bt” (*Bacillus thuringiensis* var. *kurstaki*), are effective against DFTM. TM Bio-Control is a naturally occurring virus that is also effective against DFTM caterpillars, but is only available through the USDA Forest Service. In 2001, the Forest Service and DNR used TM Bio-Control to treat 16,000 acres in the Methow Valley and successfully reduced DFTM populations. Please contact the Washington State Department of Agriculture for current pesticide information. When using pesticides, always read and follow the label. It is a violation of state and federal law to apply a pesticide in a manner not described on the label.

Mating disruption (experimental). Forest Service studies suggest that mating disruption can be used to reduce DFTM populations. Adult female DFTM produce a pheromone to attract males. In mating disruption, a synthetic version of this pheromone is distributed at high concentrations to confuse males so they are unable to locate a mate. Because this strategy targets adult moths, it does not reduce defoliation in the year of treatment. However, it can reduce the number of eggs laid in the fall. In 2009, Forest Service entomologists are planning to test the effectiveness of mating disruption at some locations in Washington.

For more information:

If you have questions about this information or want to report Douglas-fir tussock moth activity, please contact Glenn Kohler, Forest Entomologist with Washington DNR (360-902-1342; glenn.kohler@dnr.wa.gov).

The USDA Forest Service’s Forest Health Protection website has detailed information on DFTM biology, management, and monitoring at: <http://www.fs.fed.us/r6/nr/fid/dftmweb/index.shtml>.